Calculus Warm Up #4-4

New team # on your WU!

Compare results using a right, left, and midpoint Riemann sum, to approximate the area under the function from yesterday's warm up.

$$\int_0^1 \sqrt{x+1}\,dx \quad , n = 4$$

from yesterday

Actual ≈ 1.2190

Simp. ≈ 1.2189

Trap. ≈ 1.2182

HW Questions: p. 289

In Exercises 1–18, find the indefinite integral.

1. $\int \frac{2}{3\sqrt[3]{x}}\,dx$

3. $\int (2x^2 + x - 1)\,dx$

5. $\int \frac{(1+x)^2}{\sqrt{x}}\,dx$

7. $\frac{1}{3}\int \frac{3x^2}{\sqrt{x^3+3}}\,dx$ $= \frac{1}{3}\int u^{-1/2}\,du$

9. $\int (x^2+1)^3\,dx$

$u = x^3 + 3$

$du = 3x^2\,dx$

$1x^6 + 3x^4 + 3x^2 + 1$

HW Questions: p. 289

In Exercises 1–18, find the indefinite integral.

11. $\int x(x^2 + 1)^3\,dx$

13. $\int \frac{x}{(x^2 + 1)^3}\,dx$

15. $\int x^2\sqrt{x + 5}\,dx$ $\longrightarrow$ $u = x+5 \quad du = dx$

$x = u - 5$

$x^2 = u^2 - 10u + 25$

$\int (u^2 - 10u + 25)u^{1/2}\,du$

17. $\int \frac{x^3 + 1}{x^2}\,dx$

$\int (x + x^{-2})\,dx$

In Exercises 21–30, use the Fundamental Theorem of Calculus to evaluate the definite integral.

21. $\int_0^4 (2 + x)\,dx$

23. $\int_{-1}^1 (4t^3 - 2t)\,dt$

25. $\int_0^3 \frac{1}{\sqrt{1 + x}}\,dx$

$u = 1 + x \quad du = dx$

$x = 0 \rightarrow u = 1$

$x = 3 \rightarrow u = 4$

$\int_1^4 u^{-1/2}\,du$

In Exercises 21–30, use the Fundamental Theorem of Calculus to evaluate the definite integral.

27. $\int_4^9 x\sqrt{x}\,dx$

$x \cdot x^{1/2}$

$\int_4^9 x^{3/2}\,dx$

29. $-2\pi \int_0^1 (y+1)\sqrt{1-y}\,dy$ (-1)

Let $u = 1-y$ $\quad du = -dy$

$y = 1-u$ for $y=0$ $u=1$

$y=1$ $u=0$

$-2\pi \int_1^0 (1-u+1)\sqrt{u}\,du$

$2\pi \int_1^0 (u-2)u^{1/2}\,du$

$2\pi \int_1^0 \left(u^{3/2} - 2u^{1/2}\right) du$

31. Find the function f whose derivative is $f'(x) = -2x$ and whose graph passes through the point $(-1, 1)$.

$f(x) = \int (-2x)\,dx$

$f(x) = -x^2 + C$

@ $x = -1 \longrightarrow 1 = -(-1)^2 + C$

$C = 2$

$f(x) = -x^2 + 2$

33. An airplane taking off from a runway travels 3600 feet before lifting off. If it starts from rest, moves with constant acceleration, and makes the run in 30 seconds, with what speed does it lift off?

$a(t) = a$

$v(t) = \int a\,dt$

$v(t) = at + C$

$v(0) = 0 + C$

$C = 0$

$v(t) = at$

$s(t) = \int at\,dt$

$s(t) = \frac{a}{2}t^2 + C$

$s(0) = 0 + C$

$C = 0$

$s(t) = \frac{a}{2}t^2$

Now in 30 secs, distance traveled = 3600 ft:

$s(30) = \frac{a}{2}(30)^2$

$3600 = \frac{a}{2}(900)$

$a = 8\ \text{ft/sec}^2$

$v(30) = 8(30)$

$v(30) = 240\ \text{ft/sec}$

In Exercises 45–48, find the average value of the function over the given interval. Find the values of x where the function assumes its mean value and sketch the graph of the function.

45. $f(x) = \dfrac{1}{\sqrt{x-1}}$ $[5, 10]$

$$f(c) = \frac{1}{10-5}\int_5^{10} \frac{1}{\sqrt{x-1}}\,dx \qquad u = x-1,\ du = 1\,dx$$

$$f(c) = \frac{1}{5}\left[2(x-1)^{1/2}\right]_5^{10}$$

$$= \frac{2}{5}(3-2)$$

$$f(c) = \frac{2}{5}$$

$$\frac{2}{5} = \frac{1}{\sqrt{c-1}}$$

$$\sqrt{c-1} = \frac{5}{2}$$

$$c - 1 = \frac{25}{4}$$

$$\boxed{c = \frac{29}{4}}$$

47. $f(x) = x$ $[0, 4]$

In Exercises 49 and 50, use Simpson's Rule with $(n = 4)$ to approximate the definite integral.

49. $\displaystyle\int_1^2 \frac{1}{1+x^3}\,dx$

$$h = \frac{2-1}{4} = \frac{1}{4}$$

$$A = \frac{1}{12}\left[f(1) + 4f(1.25) + 2f(1.5) + 4f(1.75) + f(2)\right]$$

January 11, 2018

Classwork - review Ch. 5 Name_____ Team____

Per___

Find the indefinite integrals

1. $\int \frac{2}{\sqrt[3]{3x}}\,dx$

2. $\int \frac{x^3 - 2x^2 + 1}{x^2}\,dx$

3. $\int x^2\sqrt{x^3 + 3}\,dx$

4. $\int \frac{x^2 + 2x}{(x+1)^2}\,dx$

$$\int \left[\frac{(x^2+2x+1)-1}{(x+1)^2}\right]dx$$

$$\int \left[1 - (x+1)^{-2}\right]dx$$

$$= x + 1 + \frac{1}{x+1} + C$$

$$= x + \frac{1}{x+1} + C$$

Find the definite integrals

5. $\int_{-1}^{1} (t^2 + 2)\,dt$

$\frac{14}{3}$

6. $\int_{3}^{6} \frac{x}{3\sqrt{x^2 - 8}}\,dx$

$\frac{2\sqrt{7} - 1}{3}$

7. $\int_{0}^{1} x^2(x^3 + 1)^3\,dx$

$\frac{5}{4}$

8. $\int_{-1}^{\sqrt[3]{17}} \frac{x^2}{x^3 - 1}\,dx$

$\ln 2$

9. A function f has a second derivative $f''(x) = 6(x - 1)$. Find the function if its graph passes through the point $(2, 1)$ and at that point is tangent to the line given by $3x - y - 5 = 0$. → $y = 3x - 5$

$f'(x) = \int (6x - 6)\,dx$

@(2,1) slope = 3 → $f'(x)$ →

$f(x) = (x-1)^3$

10. Find the c guaranteed by The Mean Value Theorem and the average value of the given function for the given interval.

$f(x) = x^3$ $[0, 2]$

$c = \sqrt[3]{2}$

Staple up. :)

Classwork Week 4

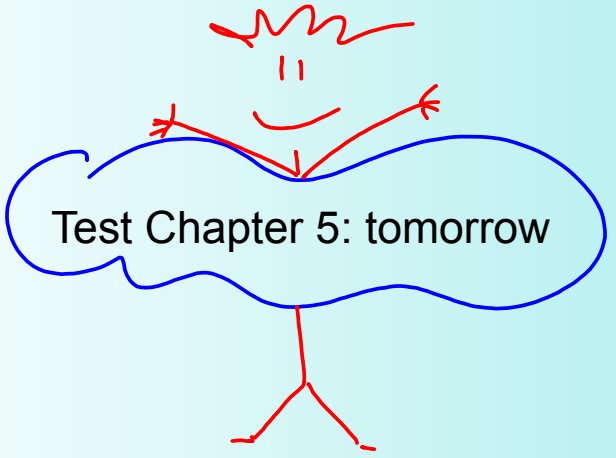
Warm Up

Pink

HW: Integration WS (blue)

Answers follow. Turn it in tomorrow!

#3 should be dt, not dx



Answers blue WS

1. $\frac{2}{9}(3x-2)^{3/2}+C$

2. $\frac{2}{5}(2-x)^{5/2}-2(2-x)^{3/2}+C$

3. $\frac{3}{7}(t-4)^{7/3}+3(t-4)^{4/3}+C$

4. $\frac{4}{3}(x+3)^{3/2}-14(x+3)^{1/2}+C$

5. $\frac{65}{2}$

6. $\frac{10}{3}$

7. $\frac{4752}{35}$

8. $\frac{10}{81}$